Bicycle Accommodation on Primary Highways

Design Manual
Chapter 11
Miscellaneous

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The Department's policy on bicycle accommodation is to provide safe, convenient and adequate bicycle facilities along the state highway system. The accommodation of bicyclists shall be considered as part of the development of all highway projects. This includes consideration of accommodation in addition to the normal roadway driving area.

The purpose of this section is to provide design guidelines for bicycle facilities when it has been determined that additional accommodation is appropriate. Three types of accommodation are addressed: bicycle lanes, paved shoulders, and separated paths. Refer to AASHTO's 1999 *Guide for the Development of Bicycle Facilities* for more information.

Bicycle Lanes

Bicycle lanes consist of extra pavement width built immediately adjacent to the driving lane. They are built on both sides of the roadway so that cyclists travel in one direction on each side—the same direction as the adjacent vehicular traffic. Pavement markings are used to clearly delineate the lanes as bicycle lanes.

Width

The minimum width for bicycle lanes should be 5 feet (1.5 meters) measured from the edge of traveled way to the gutterline.

Pavement Markings

A six-inch (150-millimeter) solid white line should be placed between the bicycle lane and the driving lane. This line should not cross pedestrian crosswalks or intersections. At signalized or stop-controlled intersections with right-turning vehicles, a six-inch wide dashed line should be used for a distance of 50 to 200 feet (15 to 60 meters) approaching the intersection. The dashed line should be used at other intersections with high volumes of right-turning traffic.

The painted bicycle symbol and directional arrow should be painted on the far side of each intersection and intermittently on long, uninterrupted sections of roadway.

Proper pavement markings and, in some cases, signing is especially important at intersections and at locations with exclusive right-turn lanes where vehicles need to cross over the bike lane to enter the right-turn lane. Refer to the AASHTO Guide and Part 9 of the MUTCD for diagrams and more information about how to handle these conflict points.

Consult the Office of Traffic and Safety for questions or guidance on unique situations regarding pavement markings.

Drainage Inlets

Curb-opening type drainage inlets (without metal grates on the pavement) are preferred in conjunction with bicycle lanes. The Department predominantly uses these types of inlets. If

grated inlets are used, the Iowa Code mandates the use of inlet types that are safely traversable by bicycles.

Paved Shoulders

If paved shoulders are used for bicycle accommodation, the minimum width should be 6 feet (1.8 meters), see Section 3C-4 for more information. This provides cyclists with some additional separation on high-speed roadways. Rumble strips should be placed as discussed in Section 3C-5. Normally, separated paths are used on expressway or freeway corridors to accommodate bicyclists because of the high speeds and traffic volumes associated with those facilities.

Separated Paths

In some cases, separated bicycle paths may be appropriate due to factors such as:

- the skill level/age of the expected cyclists.
- high traffic speeds (such as expressways with 65 mph posted speeds).
- high traffic/truck volumes.
- narrow roadways, shoulders, and bridges on existing roadways.

Width

The width of two-way separated paths should normally be 10 feet (3 meters).

Horizontal Clearance

A minimum 2-foot (0.6-meter) horizontal clearance, 3 feet (0.9 meters) desirable, should be provided to obstructions. This area should also be graded to 6:1 or flatter on both sides of the path. Tunnels or undercrossings should be wide enough to accommodate emergency and maintenance vehicles if no other access is available within a reasonable distance. A typical ambulance width (including mirrors) is 11 feet (3.4 meters).

Additional clearance may be needed on the inside of horizontal curves depending on the radius of the curve and the stopping sight distance. Refer to Table 4 on page 46 of the AASHTO Guide.

Vertical Clearance

The vertical clearance to obstructions should be a minimum of 8 feet (2.4 meters). Enough vertical clearance should be provided to accommodate emergency and maintenance vehicles if no other access is available within a reasonable distance. A typical ambulance height is 8.5 feet (2.6 meters).

Horizontal Alignment

If possible, horizontal curve radii should be at least 100 feet (27 meters). This is based on a 20 mph design speed and a 15 degree lean angle. If this is not feasible because of site constraints, other options such as temporary widening, signing, and minor superelevation may be appropriate. See the AASHTO Guide for more information.

Grade

Grades should normally be limited to 5%. This may be exceeded for short distances (such as in areas with hilly terrain). Table 1 provides recommended grade restrictions. If these grades are not feasible, other mitigating features may be appropriate. See the AASHTO Guide for more information.

Table 1

grade (%)	distance (ft)	distance (m)
5–6	800	240
7	400	120
8	300	90
9	200	60
10	100	30
11+	50	15

Sight Distance

The AASHTO Guide provides a set of graphs and tables for determining stopping sight distance for bicycle paths. A 20 mph (30km/h) design speed should be used.

Drainage Structures

Normally, drainage structures underneath bicycle paths should be designed to the same design year storm as the roadway drainage structures. This is best accomplished by extending smaller structures through the path and moving the path in to cross larger structures, see Figure 1 on next the page.

For bicycle paths placed on the backslope, smaller drainage structures, normally, pipes less than 60 inches (1500 millimeters) and box culverts less than 5 feet × 4 feet (1.5 meters × 1.2 meters), should be extended through the path. For larger culverts, the path should be moved in to cross the structure and then moved back out to the backslope. If this is done, longitudinal drainage will have to be provided where the path crosses the ditch. Depending upon how close the path comes to culvert openings, safety railing may be needed on the culverts.

For bicycle paths on the foreslope, culverts should be extended as necessary.

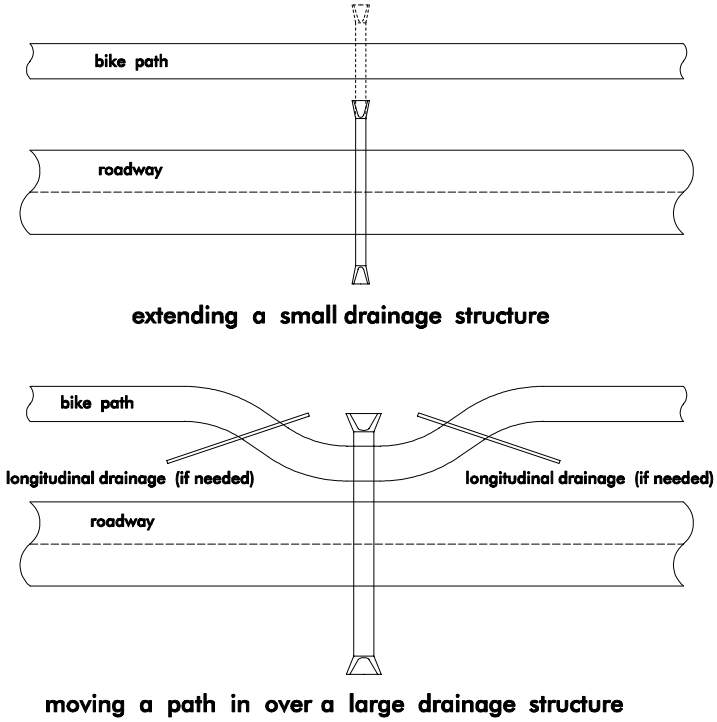

Figure 1: Accommodating drainage structures.

Bridges

If a new bridge is to be built, it will normally provide a 10-foot (3.0-meter) wide bike path. This will provide adequate shy distance to concrete barrier rail. If especially heavy use is anticipated, a 12- or 14-foot (3.6- or 4.2-meter) wide bike path should be considered.

Most existing bridges will be too narrow to accommodate a full-width path plus barrier to separate bicycle traffic from vehicular traffic. In these situations, a separate structure or bridge widening should be considered. If a separate structure is to be constructed, it should be a minimum of 10 feet (3.0 meters) wide. If a bridge is to be widened, it should be widened to provide a minimum 10-foot (3.0 meter) wide path. This will provide adequate shy distance to barrier rail.

If widening a bridge or building a new structure is beyond the scope of a project, it may be possible to use an existing sidewalk as a path. The path should be separated from vehicular traffic with a barrier. Signage may be necessary instructing cyclists to dismount before crossing the bridge. The designer should contact the Office of Design and the Office of Traffic and Safety for further assistance if considering a narrowed path across a bridge.

Barriers

AASHTO stresses the importance of separation between two-way paths and the roadway to demonstrate that the path is an independent facility from the roadway. They recommend a barrier if a two-way path is within 5 feet (1.5 meters) of the roadway shoulder. Barrier or railing may also be warranted at culvert openings, steep embankments, dropoffs, or other areas of concern. Consult the Methods Section for assistance if unsure of whether or not a barrier is warranted.

Pavement Design

Road Design Details 7402 and 7403 provide construction details for granular and paved surface bicycle paths. Plans shall specify PG 58-34 binder for projects north of Highway 18 and PG 58-28 for projects south of Highway 18 if an HMA paved surface is to be used. Width of trail and type of paved surface determine pavement thickness. Type of maintenance vehicle will determine the need for and thickness of subbase material. Contact the Pavement Design section in the Office of Design.

Path-Roadway Intersections

Handling the intersection of the path with roadways is one of the most critical design issues when designing two-way separated paths. The potential exists for numerous conflicts with turning, through, and merging traffic. A variety of variables must be considered including turning movements, right-of-way constraints, traffic signals, sight distance, refuge islands, and others.

The AASHTO Guide provides a good discussion of the issues that should be considered when intersecting roadways. Each intersection will need to be evaluated individually in detail to determine the safest way to move bicycle traffic through the intersection.